Council

CNL(01)69

Report of the 2001 Special Liaison Meeting to Review Measures Taken by Denmark (in respect of the Faroe Islands), Iceland and the USA to Minimise Impacts of Aquaculture on the Wild Stocks

Opening Remarks by Mr Jacque Robichaud, President of NASCO

Distinguished delegates, ladies and gentlemen:

I would like to welcome all of you to our first session in beautiful Galicia for this, our Eighteenth Annual Meeting. This Special Liaison Meeting to Review Measure to Minimise Impacts of Aquaculture on the Wild Stocks takes place before the main Opening Session of the Council tomorrow, so I will reserve my Opening Remarks about this year's meeting until then.

At this, our third Special Liaison Meeting, we will hear about the measures being taken by the Faroe Islands, Iceland and the United States to minimise impacts of aquaculture on the wild stocks. It will be very interesting to hear these presentations because the Faroe Islands has developed quite a significant salmon farming industry but has few wild salmon rivers; Iceland has a small salmon farming industry at present but there are proposals to expand it; and the United States has a developing salmon farming industry right next door to salmon stocks recently listed as endangered under the Endangered Species Act. So I think we will learn some interesting things today. A report of last year's meeting, which comprised presentations by the EU and its Member States, has been included in the papers issued by the Secretariat. The purpose of these Special Liaison Meetings is to allow us to share experiences to date of the measures that are being used to minimise impacts of aquaculture and to discuss critically and openly with our colleagues from the industry the additional measures that might be necessary to protect the wild stocks in concert with the development of the salmon farming industry. It is now seven years since the Oslo Resolution was adopted and, as we have seen from the presentations so far, progress has been made in implementing the measures in the Resolution and more must be done. The Council has recently recognised that the measures in this Resolution need to be fully implemented and stronger measures considered. We can learn from the positive elements of these reports, in order to safeguard the wild stocks.

In the past two years we have made progress in developing a "fresh start" to the process of liaison with the salmon farming industry so as to develop closer, more open and broader cooperation on issues of mutual concern. We welcome this progress and I would like to particularly welcome representatives of the salmon farming industry to this meeting. We will also be considering the first product of this new cooperation in the form of draft guidelines on containment of farm salmon. These are important initiatives since, as recently as our Sixteenth Annual Meeting two years ago in Westport, the Council recognised that, and I quote, while "there have been improvements to cage structures to reduce escapes, containment measures are currently not adequate to deal with the problem. Renewed efforts should, therefore, be made to minimise escapes and a more effective enforcement policy should be adopted by the Parties". I hope that regulatory bodies within the Parties will take action. We will also need to be sure that the containment guidelines as drafted really do represent progress in improving containment when implemented through national action plans and whether there are other methods to protect genetic diversity and integrity. We will then need to look at all of this in the light of the Precautionary Approach.

Last year Mr Lemche stressed in his introductory remarks at the second Special Liaison Meeting that NASCO is certainly not anti-salmon farming, and that we do not believe that all the problems of the wild salmon are due to aquaculture. He was absolutely correct, and equally he was correct to say that to argue that there can be no impacts on the wild stocks

would be ridiculous. I hope that through our joint meetings the industry has gained a better understanding of our concerns and we will gain a better understanding of their concerns. We are determined to conserve the abundance and diversity of wild salmon stocks; our Convention commits us to that. We believe that it is also in the industry's interest to protect the wild stocks and we seek your cooperation to achieve this. We have made progress with the new liaison structure. We will return to these issues on our Council agenda this week. The presentations in this session by the three countries concerned will provide an interesting introduction to our deliberations. With these remarks, I will now ask Mr Ari Johanneson to introduce the presentation of the Faroe Islands.

Measures to Minimise Impacts of Aquaculture on the Wild Stocks in Iceland

Árni Ísaksson, Director, Directorate of Freshwater Fisheries, Reykjavik, Iceland

Major Provisions in Icelandic Laws and Regulations

Section II. General measures
Licensing and Monitoring

Laws and Regulation Regarding Aquaculture

Acts

- Act no. 73/1997 on Planning and Building
- Act no. 106/2000 on Environmental Impact Assessment
- Act no. 7/1998 on Environmental and Food Control
- Act no. 44/1999 on Nature Conservation
- Act no. 55/1998 on Treatment, Production and Distribution of Marine Products
- Act no. 76/1970 on Salmonid Fisheries with later amendments. A revision of the Aquaculture section of the Act passed through Parliament in late May 2001.

Regulations

- Regulation no. 48/1994 on Pollution Control
- Regulation no. 597/1989 on Disease Prevention and Health Inspection of Aquaculture Facilities
- Regulation no. 105/2000 on Transfer and Release of Salmonids and Prevention of Disease and Genetic Interaction
- Regulation no. 226/2001 specifying Areas where Farming of Fertile Salmon is Prohibited

Environmental Impact Assessments

- Marine Fish Farms under 200-ton production exempt from Environmental Impact Statement (EIS).
- Marine Fish Farms exceeding 200-ton production subject to evaluation and decree by the Icelandic Planning Agency regarding the need for an EIS.
- Freshwater Fish Farms under 20-ton production exempt from EIS.
- Freshwater Fish Farms exceeding 20-ton production subject to evaluation and decree by the Icelandic Planning Agency regarding the need for EIS.

Licensing System

- Split into an “Environmental Licence” dealing with pollution control and an “Operating Licence” dealing with ecological, genetical and disease issues.
- “Environmental Licences” either by the Environmental and Food Agency or communal Health Inspection Authorities.
- “Operating Licence” by the Directorate of Freshwater Fisheries.

Environmental Licences

- Pertains mostly to pollution, harmful chemicals, distribution of suspended solids and other local environmental issues.
- Environmental licensing of Marine Fish Farms exceeding a production of 200 tonnes by the Environmental and Food Agency.
- Environmental licensing of Freshwater Fish Farms exceeding a production of 20 tonnes by the Environmental and Food Agency.
- Environmental licensing of stations with a smaller production as well as ranching stations by communal Health Inspection Authorities.

Environmental Licence Specifications (Act no.7/1998 on Environmental and Food control)

- Issued by the Environmental and Food Agency for major fish farms (>200 tonnes).
- Section 1 specifies the production volume, tonnage produced and general requirement concerning waste treatment.
- Section 2 specifies criteria concerning environmental standards as well as pollution control.
- Section 3 specifies control and monitoring visits and relevant fees.
- Coast-based salmon farms must discharge wastewater far enough to ensure rapid dilution of the effluent.
- Marine cage farms must conform to harbour rules, be clearly marked and fitted with caution lights if necessary.
- Marine Farms must collect environmental information and run monitoring routines to ensure a healthy environment.
- The farm must fulfil environmental criteria according to Pollution Control Regulation.
- The farm must fulfil environmental criteria with respect to use of antibiotics and disinfectants.

Operating Licence Specifications (Salmonid Fisheries Act no. 76/1970 with later amendments)

- Pertains to ecological, parasitological, disease and genetic interactions.
- Issued by the Directorate of Freshwater Fisheries after consulting the Fish Disease Committee, the Fish Disease Veterinarian, the Freshwater Fisheries Committee as well as the Institute of Freshwater Fisheries regarding genetic and ecological interactions.
- An EIS report, if required, must be available.
- Applicant must provide a valid Environmental Licence.
- Applicant is expected to provide satisfactory information on potential threats to wild salmonid stocks as a result of the proposed aquaculture activity. Failing to provide such information, the applicant can be required to fund additional research related to ecological, parasitic, disease and genetic threats prior to processing of an application.
- If application is satisfactory, the Directorate issues an operating licence for a 5-year period.

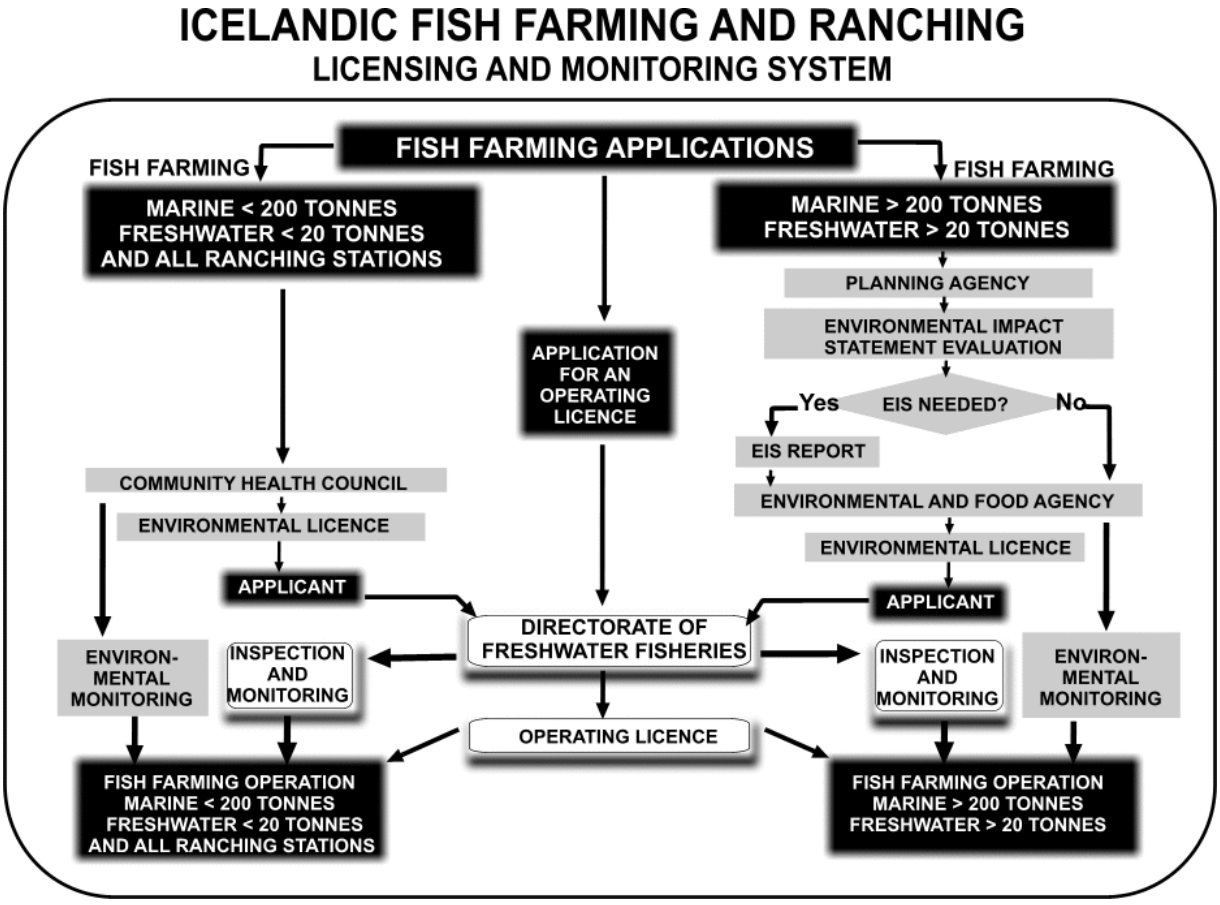
Validation of the Operating Licence

- The Operating Licence becomes valid after the aquaculture facility has been assessed and approved by the Directorate and the Office of the Fish Disease Veterinarian.

- The Operating Licence shall contain specifications regarding the species being reared, total production allowed and any precautionary conditions related to the escape of fish from cages and their recovery.
- The Operating Licence may impose financial obligations upon the applicant regarding tagging, surveillance and additional research related to disease, parasitic as well as genetic threats to wild salmonid stocks locally and in nearby areas.
- The Operating Licence is non-transferable and cannot be leased or pawned.
- The operator of an aquaculture facility must report accidental relases to the Directorate of Freshwater Fisheries.

Surveillance and Monitoring of Fish Farms

- Local environmental factors and sea cage integrity are monitored and inspected by the Environmental Agency and communal Health Inspection Authorities.
- General fish health, including fish diseases and parasitic infections, are monitored and inspected by the Office of the Fish Disease Veterinarian, which also issues health certificates.
- Overall technical and rearing performance as well as compliance with operating licence requirements is monitored and inspected by the Directorate of Freshwater Fisheries.
- Aquaculture facilities are required to keep a diary or a log book, recording daily events such as health status, feeding regime, fish transfers and various other factors.
- Marine fish farms will be inspected at least twice a year, land-based farms once a year.
- All hatcheries and fish farms must report annually to the Directorate regarding total production, origin of broodstock, feed use, annual sales and other relevant issues.



Section III. Transfers and Release

Measures to Minimise Genetic, Parasitic and Disease Interactions (Salmonid Fisheries Act no. 76/1970 with later amendments)

- River association intending to perform enhancement through smolt or fry releases or maintenance of angling through smolt releases must make a 5-year Enhancement Plan for the salmon river, which is subject to approval of the Directorate of Freshwater Fisheries.
- River associations intending to perform enhancement must get a permit for collecting broodfish from the Directorate.
- Local stocks must be used for enhancement in salmon rivers. Exemption for the use of a salmon stock from a similar habitat can be granted by the Directorate following an environmental evaluation. Such exemptions, however, are only granted in accordance with the 5-year Enhancement Plan.
- Transfer of wild, ranched and reared salmonids into a natural watershed for angling is prohibited. Exemption can be granted by the Directorate after receiving comments from the Fish Disease Veterinarian on possible disease interactions and from the Institute of Freshwater Fisheries on possible ecological and genetic interactions.
- Transfer of species not-specified in the respective operating licences between rearing and ranching stations is prohibited as well as the transfer of live fish and their eggs between watersheds. The Directorate can grant an exemption upon receiving comments from the Fish Disease Veterinary officer, the Fish Disease Committee and the Institute of Freshwater Fisheries regarding possible genetic interactions.
- The use of selectively bred salmon strains shall be confined to salmon farms and their use for enhancement and ranching is prohibited. The Directorate can grant a research organization an exemption for small-scale experiments after consulting the Institute of Freshwater Fisheries.

Measures to Minimize Genetic, Parasitic and Disease Interactions (Regulation no. 105/2000 on Transfer and Release of Salmonids and Prevention of Disease and Genetic interaction)

Transfer and Release of Salmon of Wild Origin

- Transfer of wild salmonids and their eggs between watersheds is subject to approval by the Directorate of Freshwater Fisheries. Wild broodfish must be slaughtered and monitored for disease according to specifications from the Fish Disease Committee.
- The Directorate can grant permission for the use of non-local stocks in rivers with no salmon stock or small stocks of salmon provided that the effects on nearby rivers are considered negligible.
- The Directorate can also permit transfer of wild salmonids into sea cages and land-based rearing stations with the approval of the Fish Disease Committee.

Transfer and Release of Salmon of Reared and Ranched Origin

- Ranching stations can use ranching stocks from approved facilities.
- Reared brood fish, disinfected eggs and juveniles of reared origin can be transferred freely between rearing facilities as long as the transfer conforms to disease regulations.

- Transfer to stations with runoff into rivers must, however, be confined to the species found in the watershed and the approval of the Directorate is needed for the introduction of other species.
- The release of salmonids of foreign origin for enhancement or ranching is prohibited. The Directorate can, however, grant an exemption to a research organization for a period of two years with the approval of the Fish Disease Committee and subject to the tagging of all fish released.

Reciprocal Distance between Aquaculture Units and their Distance from Salmon Rivers

- Minimum distance from sea cages to rivers with an annual catch exceeding 100 salmon is 5 km.
- Minimum distance from sea cages to rivers with an annual catch exceeding 500 salmon is 15 km. The distance can be shortened to 5 km if sterile salmon are being used.
- Minimum distance between sea cages and from those to land-based operations or ranching stations shall be 2 km.
- A conditional 2-year exemption can be granted by the Directorate with the approval of the Fish Disease Committee.

Section IV. Setting of Regulatory Measures and Aquaculture Zones

Salmonid Fisheries Act no.76/1970
with later amendments

Regulatory Measures

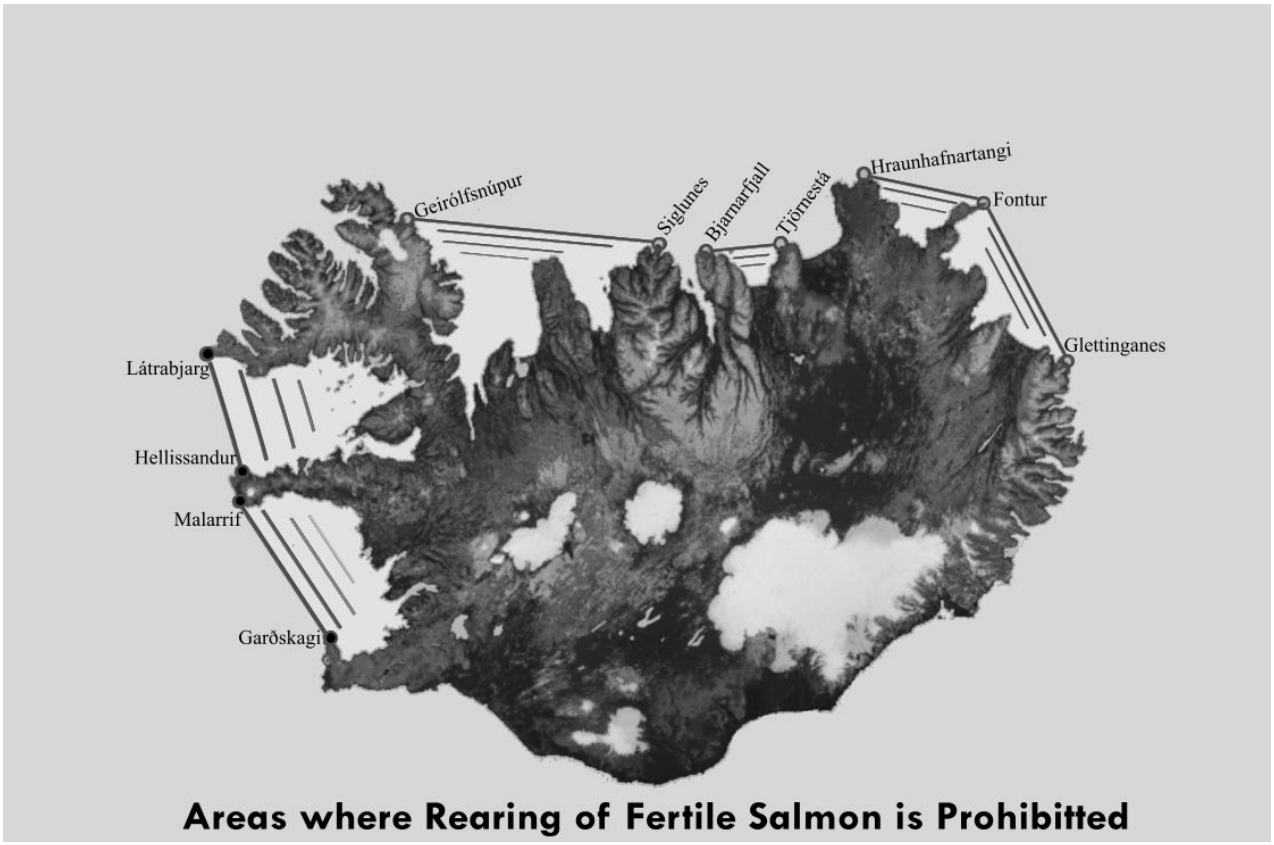
The Ministry of Agriculture can set regulatory measures covering the following items:

- The contents and the issuing of an operating licence.
- Microtagging of all or some of the smolts used in sea cages.
- The use of sterile salmon in aquaculture.
- The use of feed in salmonid farms.
- Maintenance of farming facilities, including sea cages.
- Monitoring, inspection and assessment of salmonid farms.
- Transfer of salmonids between salmonid farms and ranching stations.
- Transfer of wild salmonids and their eggs between watersheds.
- Wild salmon coastal protection areas, where salmon farms are prohibited
- Setting up of specific aquaculture areas.
- Setting up of a maximum production quota in aquaculture areas.

Aquaculture Zones and Salmon Protection Areas

- Protection areas can be set up to prevent disease, parasitic and genetic interaction through a regulatory measure.
- Specific aquaculture areas can be set up through a regulatory measure.
- Total production quota in an aquaculture area can be specified through a regulatory measure.
- A regulatory measure has been set, which prohibits rearing of fertile salmon in sea cages in certain fjords and bays in Iceland (Regulatory measure no. 226/2001).

- A Fish Farming Committee composed of administrative and scientific personnel from the Agricultural and Marine Departments has been recently established to coordinate fish farming activities of salmonids and marine species in various areas.



Section V. Control of Fish Diseases and Zoning

Disease Legislation and Authorities Responsible for Surveillance and Disease Control

- The Salmonid Fisheries Act, no. 76/1970 was amended and extended in 1970, which provided the Fish Disease Enforcing Authorities with a wide range of statutory powers, and established certain legal obligations for river owners, fish farmers and fish importers.
- The Fish Disease Committee, which assists the Minister of Agriculture in matters related to prevention and control fish diseases, was established at that time. It is headed by the Chief Veterinary Officer but is otherwise comprised of the Director of Freshwater Fisheries and the Director of the Institute for Experimental Pathology of Animals.
- In 1985 a new law (no. 61/1985) about a "Veterinary Officer for Fish Diseases" was brought into force in response to changing fish disease risks, as fish farming was expanding and knowledge of such disease increasing. This law was followed by a new regulation in 1986 (no. 403/1986) concerning measures to prevent and control fish diseases and provide health inspection at fish farms.
- In 1986 a new law was enacted establishing the Fish Disease Laboratory as a separate department of the Institute for Experimental Pathology.

Natural Salmonid Species and Legislation Concerning their Health Control

- There are three natural and one imported salmonid species in Iceland; that is, Atlantic salmon (*Salmo salar* L.), Brown trout (*Salmo trutta*), Arctic char (*Salvelinus alpinus*) and rainbow trout (*Onchorhynchus mykiss*). There are both sea-run and non-migratory populations of trout and char.
- The fishing rights are private and all the owners on a river system are obliged to form a "River Association", which manages the cultivation and restocking projects.
- There are 45 major salmon rivers around Iceland, of which many are following a cultivation plan on restocking. Since 1985 there has been a compulsory monitoring programme for fish diseases regarding wild broodfish, in the same manner as for farmed salmonids.

System of Disease Monitoring, Health Status and Implementation of International Regulations

- Since 1985 all fish farms in Iceland have been under obligatory and regular fish health surveillance.
- Since 1993 Iceland has followed the European Union (EU) regulations and used the requirements laid down in Council Directive 91/67/EEC and the disease control measures provided for in Directive 93/53/EEC as guidelines in the national fish health monitoring system.
- The sampling and diagnostic procedures as detailed in Commission Decision 96/240/EEC were followed.
- The fish health status in Icelandic aquaculture in general is very promising. The main reasons for that are presumed to be the geographical isolation of the country, strict import policy, secure water supply for the farms and effective fish health surveillance.

Fish diseases occurring on fish farms in Iceland during the last decade:

	Annual incidence of new outbreaks / no. of farms										
Fish disease:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Atyp. furunculosis	2*	1*	3*	1*	0	0	0	1*	0	0	0
BKD	1*	0	1*	1°/·	4*	1*	0	0	0	0	0
Winter ulcers	1*	0	2*	0	1·	0	0	0	0	0	0
Cold water vibriosis	0	0	0	1·	0	0	0	0	1·	0	0

* On growing farm - land based (salinity: 10 - 25‰)
· On growing farm - sea cages (full salinity)
° Hatchery/smolt farm (fresh water)

Public Authorities Administering Importation of Live Fish and their Gametes

- The Minister of Agriculture has supreme authority on matters concerning imports and all matters related to fish diseases.
- He is advised by the "Fish Disease Committee".
- The enforcement and surveillance authority rests with the "Veterinary Officer for Fish Diseases".
- Disease diagnosis and sample analysis rests with the "Fish Disease Laboratory".

- During the last fifty years the import of live fish, eggs and gametes to Iceland has been very restricted. Fish species have only been imported as disinfected eggs, with one exception, and these imports are as follows:

Importation of Salmonids, other Fin-fish and Molluscs to Iceland

1951: Disinfected rainbow trout eggs (*Oncorhynchus mykiss*) from Denmark.
1984 - 1987: Disinfected salmon eggs (*Salmo salar* L.) from Norway, one import yearly from VHS and IHN free zones.
1994: Seabass larvae (0,5 gr) (*Dicentrarchus labrax*) from France, from zones free of VHS and IHN.
1995-2001: Disinfected seabass eggs (*Dicentrarchus labrax*) from France, 1-2 imports yearly, from zones free of VHS and IHN.
1999: Disinfected turbot eggs, 4 dl (*Psetta maxima*) from France.
1988: Red abalone (*Haliotis rufescens*) from California, U.S.A.
1996:Red abalone (*Haliotis rufescens* + *Haliotis discus hannai*) from Japan.

Official Certification Systems and Listing of Diseases for the Export of Live Fish and their Gametes

- The official certification associated with export of live fish, eggs and gametes is under the supervision of the Veterinary Officer for Fish Diseases. The certification is never made without intensive disease screening and laboratory examination.

There are three categories of diseases, as follows:

- List A diseases: Transmissible diseases which have the potential for very serious and rapid spread and which are of serious socio-economic importance in the international trade of live fish, eggs and gametes. List A diseases will be subject to eradication procedures as these diseases are considered to be dangerous and exotic to Iceland. Measures are taken immediately and reports submitted to the OIE.

- List B diseases: Transmissible diseases which are considered to be of socio-economic importance within the country and which are significant in the international trade of live fish, eggs and gametes. Measures are variable, from eradication procedures to general vaccination.

- List C diseases: Diseases registered once a year.

Potential Diseases Listed in Iceland by the Veterinary Officer for Fish Diseases

List A diseases:	List B diseases:	List C diseases:
Infectious salmon anemia (ISA)	Furunculosis	Viral erythrocytic necrosis (VEN)
Infectious pancreas necrosis (IPN)	Atypical furunculosis	Ulcerative dermatic necrosis (UDN)
Infectious haematopietic necrosis (IHN)	Piscirickettsiosis	Papilomatosis
Epizootic haematopietic necrosis (EHN)	Bacterial kidney disease (BKD)	Mycobacteriosis
Oncorhynchus masou virus (OMV)	Enteric red mouth (ERM)	Epitheliocystis
Viral haemorrhagic septicaemia (VHS)	Systemic spironucleosis	Winter ulcers
Spring viraemia of carp (SVC)	Pancreas disease (PD)	Vibriosis
Viral nervous necrosis (VNN)	Erythrocitic inclusion body syndrome	
Gyrodactylosis	Proliferative kidney disease (PKD)	
	Salmon louse infection	
	Marine louse infection	
	Whirling disease	
	Swimbladder nematode of eel	

Fallowing and Other Possible Emergency Measures in the event of a Positive Disease Diagnosis

- According to Act no. 25/1993, governing animal diseases and preventive measures against them, the Minister of Agriculture may prescribe any measures, by suggestions from the Chief Veterinary Officer, deemed necessary to eradicate or prevent the spreading of List A and List B diseases.
- According to the Salmonid Fisheries Act no. 76/1970 the Minister of Agriculture can prescribe, if so advised by the "Fish Diseases Committee", any measures necessary to eradicate and prevent spreading of contagious fish diseases.
- Eradication procedures followed by cleaning, disinfection and fallowing will be carried out if List A fish diseases (and in some cases List B fish diseases) are diagnosed.

Disease Zones and Degree of Contact between the Farmed Aquatic Animals and those of Natural Populations

- Iceland is divided into only two different disease zones, an open sea water zone and a land-based fish farming zone. For many years there has only been <u>one</u> particular fish farm using sea cages in the open sea. Almost all of the on-growing fish farms in Iceland have been land-based, supplied exclusively with pumped fresh and sea water from bore-holes.

- The pumped water supply has <u>no</u> contact with surface water or open sea and therefore no possible contact with wild fish. The land-based zone is recognised by the Official Authorities, in accordance with the recommendations of the International Aquatic Animal Health Code of the EU, as being free of virus diseases as well as many bacterial diseases like BKD, Enteric red mouth and Furunculosis.

Use of Medicines and Disinfectants

- Use of medicines is controlled by the Veterinary Officer for Fish Diseases
- Use of disinfectants is controlled by the Environmental and Food Agency

Disinfection of Angling Equipment

- All fishing equipment brought to Iceland for angling purposes must be disinfected at the port of entry.

- Such facilities are provided at the Keflavík International Airport as well as at the Seyðisfjörður ferry terminal on Iceland's east coast.
- A valid certificate of disinfection from a veterinary officer is accepted and encouraged to reduce delays.

Measures to Minimise Impacts of Aquaculture on the Wild Stocks in the United States

Edward Baum, Atlantic Salmon Unlimited, Hermon, Maine
and
Mary Colligan, National Marine Fisheries Service, Gloucester, Massachusetts

1. Introduction

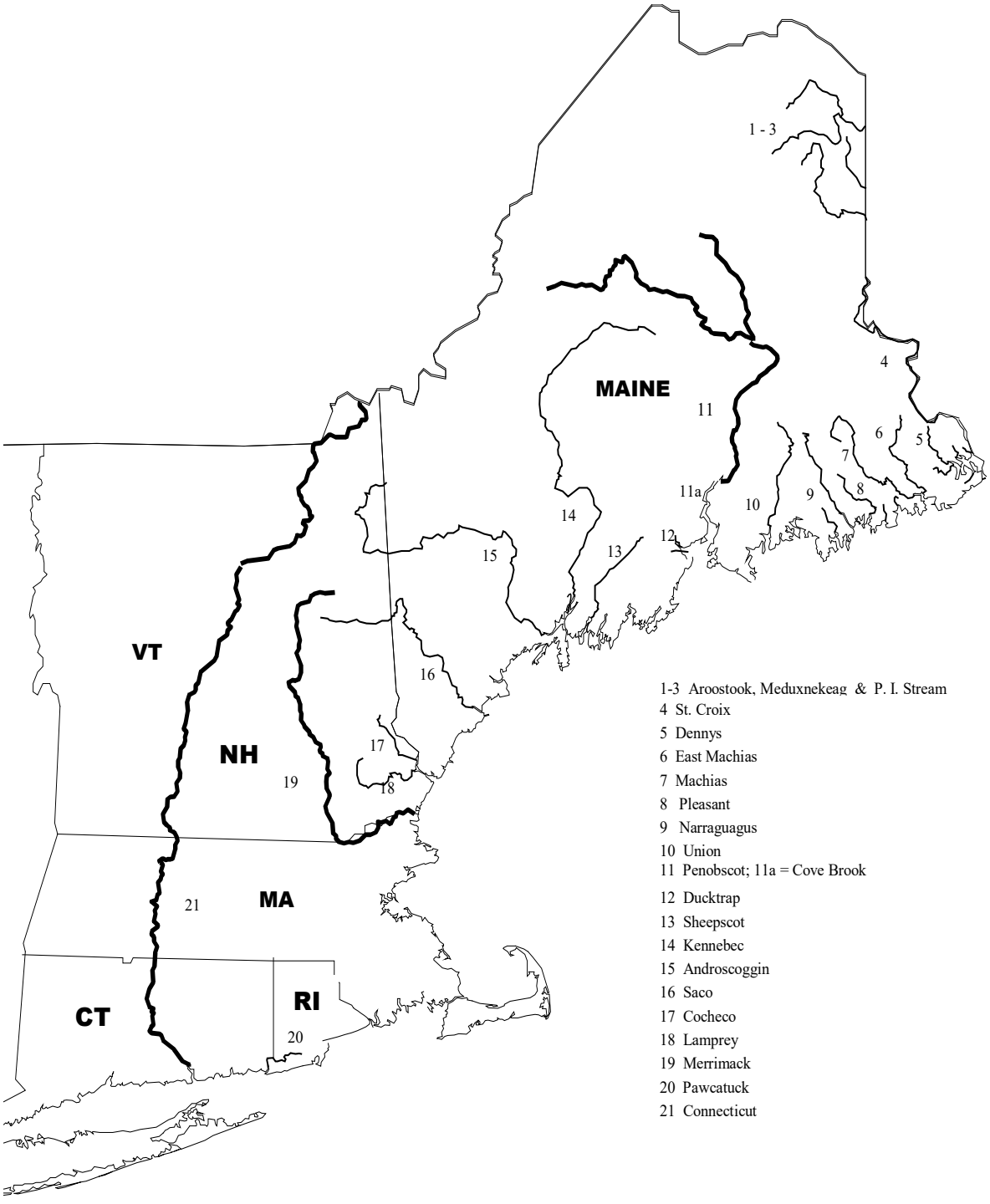
The rapid decline of wild salmon stocks in the USA, concurrent with the rapid growth of the salmon farming industry, has resulted in biological, social, and political conflicts. The potential for conflicts is enhanced by the geographical overlap between USA farm sites and rivers with wild salmon populations. The challenges facing efforts to protect and recover wild salmon stocks, while promoting international competitiveness of the salmon farming industry, are not unique to the USA. In recent years progress has been made in the areas of communication, data and information sharing, and measures instituted by the industry on a voluntary basis. Additionally, an atmosphere has developed in which government, industry, and non-government entities work cooperatively on strategies to minimize interactions between farmed and wild salmon with minimal interference in commercial operations. Given the current status of the species, it is imperative that all parties continue our cooperative efforts to address these significant issues. Those measures and strategies undertaken by the USA in recent years and how they relate to implementation of the Oslo Resolution are presented in the following pages.

2. Status of USA wild Atlantic salmon stocks

2.1 Overview of USA rivers with Atlantic salmon populations

Atlantic salmon restoration and management programmes occur in 21 rivers throughout the New England region of the USA (Figure 1). In southern New England waters (south of Cape Cod, Massachusetts) salmon restoration and management programmes occur in the Connecticut River drainage, in the states of Connecticut, Massachusetts, Vermont and New Hampshire, and in the Pawcatuck River, which is in the state of Rhode Island. In northern New England (north of Cape Cod, Massachusetts) salmon restoration and management programmes occur in 3 rivers in New Hampshire (the Merrimack and 2 small coastal rivers), and 16 rivers in Maine. The Penobscot River represents the largest Atlantic salmon restoration programme in Maine. It is important to note that in November 2000 the USA Federal Government listed 8 small salmon populations in Maine (including one small tributary to the lower Penobscot River) as endangered under the Endangered Species Act (ESA) of 1973. Listing the Atlantic salmon under the ESA requires that all Federal Agencies be subjected to the same species protection rules and regulations that apply to business and industry (e.g., the aquaculture industry).

Figure 1 Map of New England, USA Atlantic salmon rivers.



2.2 Documented Atlantic salmon returns to USA rivers

Documented Atlantic salmon returns to rivers in New England in 2000 were 803 salmon, which was about 45% lower than the previous year. Returns of 1SW salmon declined by 29% from 1999 to 2000 (380 to 270), while MSW returns to New England declined by 50% from the previous year (1,072 to 533). Total salmon returns to the rivers of New England continued the downward trend that began in the mid-1980s, and were 58% and 66% lower than the previous 5-year and 10-year averages, respectively. Total documented Atlantic salmon returns to USA rivers have declined from >5,000 in the past 25 years (Figure 2) to current levels. It should be noted that the numbers illustrated in Figure 2.2 are minimal estimates, since many rivers in Maine do not contain fish-counting facilities and since all facilities throughout New England are less than 100% effective at capturing adult salmon. Most USA Atlantic salmon returns are recorded in the rivers of Maine, with the Penobscot River accounting for about 67-85% of the annual total. Atlantic salmon returns to the Connecticut River usually represent about 10% of the USA total, with the balance recorded in the Merrimack River in New Hampshire. Less than 1% of salmon returns are recorded annually in the Pawcatuck River in Rhode Island and the smaller coastal rivers of New Hampshire.

Adult returns in the 1970s and 1980s were often 50-100% of conservation spawning escapement requirements (expressed as MSW females) for many rivers in Maine. However, in recent years, estimated spawning escapements in most New England rivers have declined to less than 5% of conservation requirements.

2.3 Management authority and fisheries for Atlantic salmon in USA rivers

Management authority for Atlantic salmon in the USA in fresh water and up to 3 miles at sea is exercised by the individual New England States, while the Federal Government retains management authority in the area from 3 to 200 miles at sea.

Although commercial fishing for Atlantic salmon was commonly practised throughout New England in the 19th century, landings steadily declined in concert with the diminishing resource. There were occasional good commercial catches in Maine during the 1920s and 1930s; however, the commercial fishery was finally closed in 1948 after a reported catch of only 40 salmon in the Penobscot River.

The first Atlantic salmon caught on an artificial fly in the USA was recorded in the Dennys River (Maine) in 1860. Angling gear and techniques used to catch Atlantic salmon in Europe were brought over to North America and successfully used in the Penobscot River beginning in the 1880s. Despite the nostalgia associated with accounts of Atlantic salmon fishing in the 1880s, the 1980s were actually the premier years for salmon fishing in the State of Maine, and excellent catches of salmon in the rod fishery continued into the early 1990s (Figure 3). In response to rapidly declining salmon returns to Maine rivers, the State of Maine instituted increasingly restrictive regulations, from grilse-only in 1994 to catch and release in 1997 and, finally, to a complete closure of fishing for Atlantic salmon in December 1999. Sport fishing for sea-run Atlantic salmon in all other New England States, and from 3 to 200 miles at sea, has been prohibited since the early 1980s.

Figure 2 Documented Atlantic salmon returns to USA rivers, 1975 - 2000.

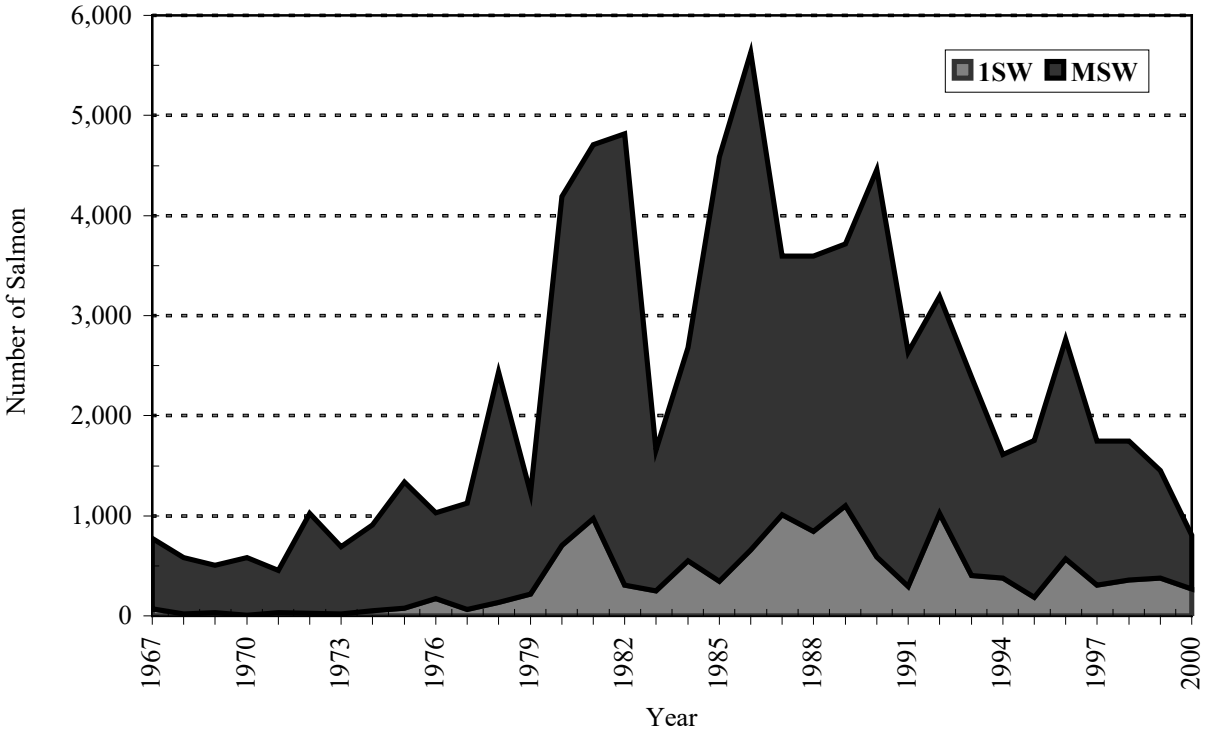
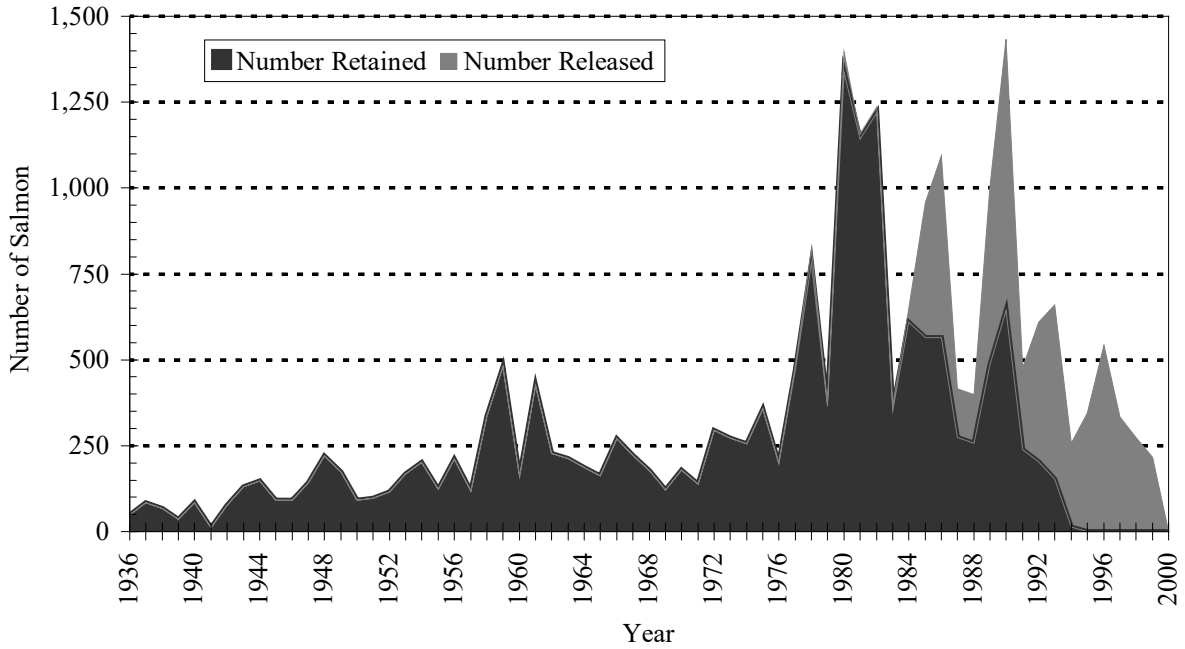


Figure 3 Sport catches of Atlantic salmon in USA (Maine) rivers, 1936 – 1999.



3. Overview of the USA Atlantic salmon aquaculture industry

3.1 Atlantic salmon farming in the states of Washington and Maine

Overview of the Washington Salmon Farming Industry

The Atlantic salmon aquaculture industry in Washington State is currently composed of 9 lease sites encompassing 120 acres of water; all are located in Puget Sound in the Seattle area. One company (Cypress Island, Inc.) controls 8 of the 9 leases, and produces >95% of the Atlantic salmon in Washington. Currently, there are 126 cages deployed in the Washington industry. The most commonly used cages are 25 x 25 metres in size, although some 15 x 15 and 12 x 24 metre cages are used. These cages are connected together with steel walkways in groups of 8 to 22; circular cages are not used in Washington.

The Washington aquaculture industry operates two freshwater smolt-rearing hatcheries, which produce up to three million smolts annually. All Atlantic salmon strains used in the Washington industry were originally provided to the industry by the US Government (National Marine Fisheries Service) beginning in 1984. A mixture of many different salmon stocks was used to establish the industry in Washington, including the following: Grand Cascapedia, from Quebec, Canada; Saint John, from New Brunswick, Canada; Penobscot, Union and landlocked salmon (Grand Lake Stream) from Maine; Connecticut River from Connecticut; and Norwegian Landcatch (imported from Scotland). No importations have occurred in Washington since the late 1980s.

Salmon production methods in the State of Washington are quite different from those used in the State of Maine. All Atlantic salmon broodstock are reared at a single freshwater hatchery, and about 2/3 are reared under controlled temperature and photoperiod regimes, which results in spawning during the month of June. The remaining broodstock are reared under normal conditions, and spawn in late October or early November. Smolts are also reared under controlled light conditions, which results in the production of smolts (ages 0+ and 1+) from February through November. In some instances smolts are held at a brackish water site for about 6 months, before being transferred to full saltwater cage sites. As in Maine, cage rearing to harvest in Washington requires about 18 months, and harvesting can now occur during all months of the year.

The Atlantic salmon farming industry in Washington has an estimated value of $25 million and provides about 145 full-time jobs (excluding personnel at the two hatcheries) for Washington residents.

Overview of the Maine Salmon Farming Industry

The Atlantic salmon aquaculture industry in the State of Maine is currently composed of 43 leased sites that encompass about 750 acres of water. Most (26) cage sites are located in the Cobscook Bay area near the Maine-New Brunswick border. Although 15 companies or individuals hold leases in Maine, 4-5 major companies produce most of the salmon reared in Maine (smaller companies rear for or sell to the larger, global companies). Atlantic salmon is the primary species of finfish under cultivation, with rainbow trout a distant second; other species reared (experimentally) in recent years include cod, haddock, flounder, pollock, charr, etc. In January 2001 there were 570 cages deployed in Maine's coastal waters. The most commonly used cages are 24 x 24 metres in size, and connected together with steel walkways

in groups of 8 to 20; additionally, 70-100-120 metre diameter cages (polarCirkels™) are also used extensively.

The Maine aquaculture industry operates five freshwater smolt-rearing hatcheries, which produce more than five million smolts annually. Although several European stocks (from Iceland, Scotland, Norway, and Finland[1]) were used in Maine from 1989-1995, the following three strains are currently under production: Penobscot, Saint John, and Landcatch. Penobscot River, Maine stocks were originally provided to the industry by the State of Maine (100,000 smolts in 1983 and 50,000 smolts in 1985), while Saint John River stocks have been imported from nearby New Brunswick, Canada since the late 1980s. The Saint John stocks were originally provided to the New Brunswick salmon farming industry by the Canadian Government (Department of Fisheries and Oceans). The Landcatch strain (a mixture of several Norwegian stocks) was originally imported to Maine from Scotland in 1989. It has been estimated that approximately 30-50% of all salmon currently under production in Maine are either pure or hybridized Landcatch strains, with either of the other two regional North American stocks. The exact percentage of Landcatch hybrids being reared in Maine is difficult to ascertain due to a rapidly changing industry and incomplete and/or inadequate record keeping. Since 1995, the State of Maine has prohibited the importation of live fish or eggs from Atlantic salmon from Europe (and west of the Continental Divide in the USA), although the importation of milt is not prohibited. Consequently, since 1997 the salmon farming industry has imported milt of the Bolak strain from Norway (via Iceland).

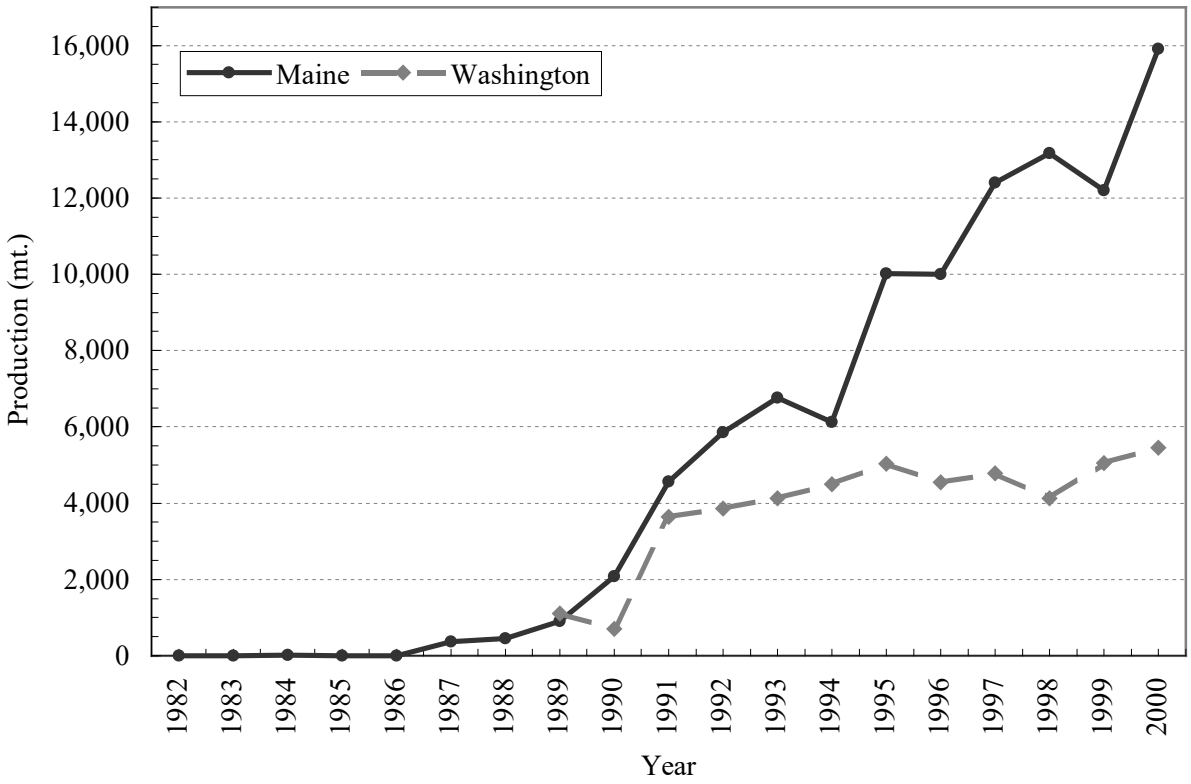
Cage rearing to harvest in Maine requires about 18 months, yielding an average standing crop of about 6 million salmon in two-year classes. Most salmon are harvested from October through March, although salmon are harvested throughout the year. The Atlantic salmon farming industry in Maine has an estimated value of about $100 million and provides about 1,100 full-time, direct jobs and another 500-700 infrastructure, indirect jobs to Maine people.

3.2 Production of farmed Atlantic salmon in the USA

The total production of Atlantic salmon in the State of Maine has increased from 20 mt in 1984 to more than 16,000 mt (> 36 million lbs.) in 2000, while production in the State of Washington has remained stable at about 5,000 mt (10 –12 million lbs.) annually (Figure 4). While Atlantic salmon production has increased rapidly since the late 1980s in Maine, New Brunswick and British Columbia, opposition to salmon farming in Washington has prevented expansion of the industry there.

[1] Icelandic stocks originated from the Eldi and Isno Rivers; Norwegian stocks (via Scotland) used were the Mowi strain (from the Landcatch Company); Finnish (Baltic Ocean) stocks originated from the Moorum River.

Figure 4 Production of farmed Atlantic salmon in the USA, 1982 – 2000.



3.3 Regulation of the industry

Federal, State, and local government authorities regulate the USA Atlantic salmon farming industry extensively. A Federal permit is required by the US Army Corps of Engineers (ACOE) for structures in navigable waters (Section 10 of the Rivers and Harbors Act of 1899), by the US Environmental Protection Agency (EPA) for discharges into coastal waters (Section 404 of the Clean Water Act, under the National Pollutant Discharge Elimination System), and by the US Coast Guard for navigational markings. A Federal importation permit is also required if live fish or eggs are imported from outside of the USA. On the State level, both Maine and Washington require aquatic lands leases, a State water quality certification permit, and additional permits to rear fish in hatcheries, to transfer fish to cage sites, and to import live fish or eggs. On the local level, Washington State requires a county and/or city shoreline development permit, while in Maine a public hearing is held for each proposed lease site to obtain input from local residents and non-governmental interests (e.g., Atlantic Salmon Federation, Trout Unlimited, etc.).

The permitting process is complex, although both Maine and Washington states have established uniform application procedures ("Unified Application and Monitoring Programme" in Maine and "Joint Aquatic Resources Permits Application" in Washington) that are used to apply for several of the required permits simultaneously. Additionally, both states have designated a lead state agency and single point contact for application and monitoring requirements.[2] Both Maine and Washington require an initial environmental assessment prior to issuance of a lease for cage sites; extensive annual monitoring at

[2] The aquaculture coordinator for the Maine Department of Marine Resources and a similar position in the Washington Department of Ecology serve as contacts for applicants and act as liaisons with other agencies.

hatcheries and cage sites is also required. The State of Maine has a very stringent finfish aquaculture monitoring programme (FAMP) that requires annual spring and fall diver survey reports and videos, water quality monitoring data at and in the vicinity around cage sites, and biennial benthic survey reports. Information pertaining to these requirements is described in greater detail in the following section.

4. Implementation of the Oslo Resolution in the United States

The United States is committed to implement the Oslo Resolution to minimize the impacts of aquaculture upon wild salmon stocks. Returns to NASCO, providing details of the implementation of the Oslo Resolution by the USA, are presented in the following categories: general measures; measures to minimize genetic and other biological interactions; measures to minimize the risk of transmission of diseases and parasites; and, research and development projects. Since the State of Washington does not fall under the jurisdiction of NASCO or the Oslo Resolution, only information applicable to the State of Maine will be presented in the following section. The summaries provided below encompass laws, rules, guidelines, and recommendations by Federal, State and local authorities, as well as actions undertaken voluntarily by the Maine salmon farming industry. Some of the regulations and guidelines listed below are being phased in with new leases or as existing leases are renewed.

4.1 General measures

General Requirements

- Leaseholders must provide evidence of technical and financial capability necessary to accomplish the project.
- Leases are granted for a maximum of 10 years.
- No single lease shall exceed 100 acres in area.
- An annual review of each lease is conducted; the lease may be revoked for non-compliance with conditions, of if operations governed by the lease are conducted in a manner substantially injurious to marine organisms.
- A harvest fee of $0.01 per pound must be paid monthly (within 30 days of harvest) with submission of the required production report form.[3]
- Anti-fouling agents used to treat net pens must be registered by the Maine Pesticide Control Board.
- Fish feed must be in pellet form.

Site Requirements and Restrictions

- On-site field studies (conducted between May 1 and Sept. 30) are required in order to characterize existing environmental and biological conditions, including reference data for future comparisons. Information to be collected includes: diver survey and videotape of flora and fauna, substrate, etc.; hydrography survey at the surface, bottom, and 1-metre off the bottom, including current speed, direction, and ability to predict fate of faecal material and unconsumed feed, etc.; water quality survey at peak stratification periods (Aug-Sept); benthic analyses, including chemical and biological

[3] Income from this fee is deposited into a non-lapsing "Salmon Aquaculture Monitoring, Research and Development Fund" which is used by the Maine Dept. of Marine Resources to develop effective and cost-efficient water quality, licensing, and monitoring criteria, to analyze and evaluate site monitoring data, and to process lease applications.

analysis; sediment analysis, including depth of redox discontinuity, total organic carbon, etc.; and an infauna survey, to establish existing benthic infauna prior to placing fish in pens.

- Accurate plans are required for each site, depicting physical structures (single pen plan, pen system arrays, on-site support structures, etc.). A mooring plan, including a description of its ability to withstand severe storms, tidal surges, and equipment break-up, and an aerial photo of the lease area must also be provided.
- Pen restrictions: not closer than ¼ mile from eagle nests or essential habitats for threatened or endangered species under State law; no closer than 1,000 feet from municipal, State, or Federally-owned beaches, parks, or docking facilities; no closer than 1,500 feet from any area designated as high use or critical habitat for threatened or endangered species protected by Federal law; not located within 1,500 feet of any area named in acts of Congress or Presidential Proclamations (e.g. national parks, wilderness area, national monuments, refuges, etc.).
- Boundary markers around lease areas shall be placed and maintained in accordance with appropriate Coast Guard regulations.
- Exact location of the State lease boundary (coordinates) must be sent to the US National Ocean Survey.
- Fish pen culture sites must be a minimum of 2,000 feet from any other finfish lease site, although an exception may be granted by mutual consent of both parties.

Operations

- Leaseholder must provide information that describes how the proposed activity will affect boat traffic in the area, feeding techniques and schedules, feed transport and processing, predator control methods, net cleaning and maintenance schedules, etc.
- Leases shall not interfere with breeding, pupping, or sensitive aggregation area of any Federally-listed marine mammals. Additionally, the incidental take of marine mammals or any bird entanglements or kills must be reported within 48 hours (mammals to the National Marine Fisheries Service, birds to the US Fish and Wildlife Service).
- Facility must be open for inspection by the permitting agency(ies) personnel during working hours, and records must be made available upon request by said agency(ies).
- Environmental monitoring data must be provided to the National Marine Fisheries Service.
- Records of containment systems must be maintained to track history, modifications, repairs and inspections, etc.
- Federal fishery agencies are now (as of 2000) recommending that the US ACOE require applicants to submit an integrated loss control plan for each site, to include predator deterrence, husbandry practices, contingency escape recovery protocols, storm preparedness measures, etc.
- An inventory tracking system is now (as of 2000) recommended by the US ACOE. It allows for clear, accurate inventory tracking of all size classes of salmon, including documentation of any escapes.
- For new leases (as of 2000), the US ACOE recommends that reports of escapes of more than 500 fish be made within 24 hours. The Maine salmon farming industry now routinely reports escapes on a voluntary basis.

4.2 Measures to minimize genetic and other biological interactions, including enhancement programmes measures

- No live anadromous Atlantic salmon, whose original source as fertilized eggs or gametes was outside of the North American continent, shall be introduced or transported to marine waters within the State of Maine.
- No live finfish of any stage of development post-hatching whose source is outside of the North American continent shall be introduced or transported to marine waters within the State of Maine.
- Weirs/trapping facilities have been installed on rivers in the vicinity of aquaculture sites to intercept and remove aquaculture escapees. The Dennys and Pleasant river facilities were installed in 1999, and the East Machias facility is to be installed in 2001; the Machias facility is currently in the design phase. Previously installed facilities on the St. Croix, Narraguagus, Union and Penobscot rivers are also used for this purpose.
- Maine scientists are in the process of implementing procedures that will allow for streamside reading of scale samples from suspected escaped farm fish captured in weirs.
- Smolt monitoring facilities on the Pleasant River are used to identify and remove any escapees from the freshwater hatchery located in the drainage.
- The US ACOE does not authorize the use of transgenic salmonids in Maine.
- Government authorities and the Maine aquaculture industry are working cooperatively to try to institute a marking system that may be used to identify fish to a specific site. (See Section 4.4, Research and Development, for additional information).
- Adoption of an industry-wide "Code of Practice for the Responsible Containment of Farmed Atlantic Salmon in Maine Waters" in October 1998. The Code is currently undergoing extensive revisions, and will be revised and upgraded to industry-leading (world-wide) standards by the fall of 2001. The new Code will be applicable to all aquaculture in Maine (finfish, shellfish, seaweed, etc.) and will incorporate both freshwater and saltwater facilities utilized by the Maine industry.
- All Maine hatcheries producing smolts for the industry are undergoing a re-engineering survey in preparation of a major programme (estimated cost: $30 million) which will better treat effluents/discharges and further reduce the likelihood of escapees from freshwater hatcheries. It is possible that some existing hatcheries may be closed.

Measures to Minimize Adverse Interactions From Enhancement Activities

- Craig Brook National Fish Hatchery, the oldest fish hatchery in the USA, was reprogrammed (beginning in 1992) from a single-broodstock and smolt production facility to a multiple (river-specific) broodstock and fry production facility. Phase I of the reconstruction programme (completed in 2000) consisted of replacing water supply pipelines, construction of a new broodstock and production building (with six broodstock holding bays), six new incubation and fry rearing units, office space, conference room, visitor center, etc. Phase II of the hatchery reconstruction programme, now underway, will provide an additional incubation and fry-rearing unit, along with additional administrative space. The newly reconstructed facility features enhanced disease screening and biosecurity protocols, in addition to salmon genetics screening activities.

- Enhancement activities (salmon stocking) by State and Federal agencies are conducted utilizing river-specific (local) stocks; emphasis is placed upon the use of fry in order to maximize natural smolt production.
- All broodstock are tagged with passive integrated transponder (PIT) tags for positive identification of individual salmon throughout their lifetime.
- All broodstock are genetically typed utilizing state-of-the-art micro-satellite DNA methods, which allows for culling of diseased individuals and/or any non-native genotypes. This process allows scientists to identify the parental origin ("familyprints") of juvenile and adult salmon throughout their life-cycle.
- Broodstock(s) used for enhancement activities are representative of the entire spawning run, with single-paired matings utilized.

4.3 Measures to minimize the risk of transmission of diseases and parasites to wild stocks of salmon

Fish Health

- Leaseholders must comply with New England Salmonid Fish Health Guidelines, or State guidelines, whichever are more restrictive.
- Only antibiotic chemicals approved by the Food and Drug Administration (FDA) shall be applied. Prophylactic use of antibiotics is prohibited.
- All smolts are vaccinated against bacterial diseases such as *Vibriosis,* etc.
- There shall be no discharge of pollutants from the facility other than fish excrement, ammonia excretions, unconsumed fish food, and medications approved by the US FDA.
- All mortalities, feed bags, fish food fines, and other waste material shall be removed daily to the mainland shore and disposed of properly.
- No dead fish or viscera to be disposed of in State waters.
- All lots of salmon at freshwater aquaculture hatcheries undergo vigorous, comprehensive, annual fish health inspections.
- All escapees captured at weirs are sacrificed and checked for diseases and parasites.
- Maine salmon farmers are working toward adequate year-class separation; about 2/3 of Maine salmon farms are currently able to achieve this goal, a substantial increase in recent years. Similarly, fallowing of sites is practised routinely where possible.
- A coordinated, integrated sea lice control programme was instituted in the Maine aquaculture industry for 2000/2001. This programme covers personnel training, monitoring at sites, and methods of treatment.
- In March 2001 the Maine salmon farming industry adopted an industry-wide ISA Action Plan. The plan incorporates aggressive disease monitoring, independent biosecurity audits, and site-specific Best Management Practices.

4.4 Research and development

- Government agencies and the Maine aquaculture industry are cooperating in a study to evaluate the feasibility of using net-pen-reared adult Atlantic salmon of river-specific origin to supplement the natural production in several Maine rivers. The purpose of this joint venture is to involve the aquaculture industry in the rehabilitation of native stocks using their facilities and expertise. An initial release of 1,054 adult salmon (2SW) occurred in October 2000; ongoing studies to evaluate reproductive

success through juvenile production and adult returns will continue for the next 6 years.

- On May 31, 2001 a precedent-setting agreement was signed between environmentalists and Maine salmon farmers. The agreement, titled "Framework for a Salmon Aquaculture Containment Policy in the State of Maine", establishes a process for the industry and environmental groups to work together to develop a better system for keeping salmon in their pens. The objectives of the agreement are: 1) to develop a mandatory, enforceable Containment Management System (CMS) for Maine salmon farmers, which will serve as a model for all farms, 2) development, testing, and implementation of a marking system for all farmed fish, and 3) development of an escape response plan in the event of an actual escape. A Steering Committee composed of salmon growers, State and Federal agencies, and environmental group representatives will guide the process.
- As part of the agreement noted above, a $5 million study was recently initiated with funding provided by the Federal government, the Maine Aquaculture Association, and the National Fish and Wildlife Foundation. The 3-year study will result in the development of an aquaculture containment verification system based upon best management practices, escape event reporting, and sea trials of selected tagging techniques at three cage sites in Maine.
- A Workshop was held in March 2001 for industry representatives and officials of Federal, State, and local government agencies to address the practicability of marking aquaculture fish to more readily assess the impact of escapees upon wild salmon populations. Additional discussions in this area are continuing.
- Government scientists are evaluating the near-shore ecology of smolts and post-smolts through the use or ultrasonic tags and the deployment of stationary detection units. This study will help identify migration routes, ecological transition zones, and some of the possible causes of marine mortality in near-shore habitats. Collaborative studies with Canadian scientists have been initiated to determine if US salmon enter the Bay of Fundy and if Canadian salmon enter US waters.
- In conjunction with the project to rear adult Atlantic salmon in Maine aquaculture industry net-pen facilities for restocking programmes, US scientists are evaluating stock-specific marine growth characteristics of commercially reared salmon and evaluating the retention of visual implant elastomer (VIE) tags as a method for marking individual salmon.
- US scientists have recently (2000) prepared a contract to conduct a survey of salmonid and non-salmonid wild fishes in the NW Atlantic for the infectious salmon anaemia virus (ISAv) and for bacterial kidney disease (BKD). To date, the following fishes have tested negative for both pathogens: Atlantic mackerel (N=120), Atlantic herring (N=40), alewife (N=60), and winter flounder (N=60). In 2001, targeted sampling of American eel and alewife were conducted in the Narraguagus, Pleasant, Penobscot, and Sheepscot rivers.
- In 2001, USA scientists initiated efforts to sample Atlantic salmon smolts and post-smolts in the Penobscot Bay estuary and open waters of the Gulf of Maine. Collection of juvenile Atlantic salmon in marine systems will allow for evaluation of parasitism rates by sea lice, incidence of disease, and incidence of escaped farmed fish in the vicinity of migrating restoration populations.

5. Conclusion

The USA shares current widespread concerns about the status of wild Atlantic salmon populations in the North Atlantic. Historical recreational salmon fisheries and salmon farming have and will continue to play important cultural and economic roles in rural areas of the States of Maine and Washington. In addition to these direct, economic benefits, many members of society also derive great satisfaction from the knowledge that uncommon or unusual animals such as the Atlantic salmon share our environment. The USA remains committed to maintaining and enhancing the economic, cultural, and aesthetic value of wild salmon runs for all components of society. Similarly, the USA recognizes that continued communication, coordination, and close cooperation between wild salmon interests and the salmon farming industry is vital to the successful restoration, maintenance, and enhancement of wild salmon runs and fisheries and to the continuation of a viable and sustainable salmon farming industry.

Measures to Minimise Impacts of Aquaculture on the Wild Stocks in Denmark (in respect of the Faroe Islands)

Ari Johanneson, Ministry of Trade and Industry, Faroe Islands

Geography

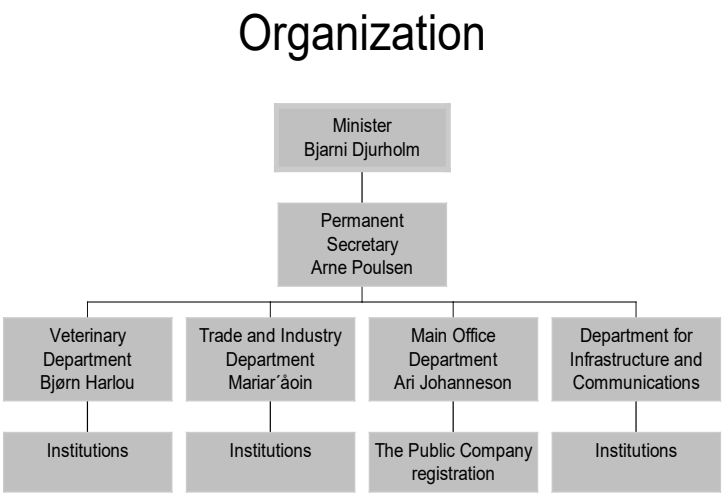
The Faroes are located in the North Atlantic, at 62º latitude North and 7º longitude West, approximately 430 kilometres south-east of Iceland, 600 kilometres west of Norway and 300 kilometres north-west from Scotland.

The Faroes comprise 18 islands, separated by narrow sounds or fjords. The total area is 1,399 sq.km. The largest island is Streymoy (375.5 sq.km) with the capital, Tórshavn. The overall length of the archipelago north-south is 113 kilometres, and 75 kilometres east-west. The islands' highest point is 882 metres. On average the land is over 300 metres above sea level. The total coast line is more than 1,000 kilometres. The islands are of volcanic origin. The population on 1 January 2000 was 45,400. There are, in all, about 100 towns and villages; the largest town is the capital, Tórshavn, with approximately 18,000 inhabitants. The second largest is Klaksvík, with 5,100 inhabitants.

The fish farming industry

Fish farming as an industry started in the Faroes in the early 1970s, initially with the rearing of rainbow trout, thereafter progressing to salmon derived from a Norwegian broodstock. The fish farming industry encompasses the maintenance of a suitable broodstock, ova, fry, smolts, and fish for the table, as well as transporting, harvesting, cleaning, gutting, processing and sales. At the beginning of the 1990s the fish farming industry went into a deep crisis. At that time the farming units were much smaller but there were many more of them. After the

crisis in the early 1990's the structure in fish farming changed to fewer but bigger units. Today there are 26 active fish farms (fish farming at sea) owned by about 15 companies.



The Ministry for Trade and Industry is the administrator of the fish farming industry. The Ministry is responsible for creating a correct and satisfactory working environment for this industry.

At the same time consideration must be given to:

- The preservation of nature;
- The work environment;
- The protection of animals.

Legislation

According to an Act of the Faroese Parliament, the Ministry department is entitled to issue a licence for fish farming. A licence is required in order to build, prepare, restructure, expand, buy or operate a farm intended for the rearing of fish. A licence is also required to operate the rearing of fish, which do not require actual farm installations. Farming is described as activities relating to the feeding of fish, the production of feed or fry, other aquatic creatures or plants, which are intended for consumption. To obtain a licence it is necessary that Faroese hold or own 2/3 of the company equity, and retain 2/3 of the deciding company votes. Also it is necessary, that no company must own more than 25% of the licences in whole, and must not either control more than 25% of the equity and/or votes of the companies.

When the government issues a licence consideration should be given to:

- The knowledge of the applicant of fish farming activities;
- Opportunities should be provided to develop this activity at a steady pace, securing an economic and scientific base at all levels of the production cycle;

- Before issuing a licence, the Ministry for Trade and Industry department shall consult with the Public Works office and the Public Food and Environmental Agency;
- The Public Works office administers the physical planning at sea, and estimates the impact of positioning a fish farm in the area;
- The Public Works office shall consider the appropriate council;
- In the event that a fish cage is to be located in the harbour region itself, the council is authorised to deny permission;
- There is no cost associated in obtaining a licence from the Ministry of Trade and Industry department;
- In the awarded licences, the prevention of disease spreading between farms is allocated as a high priority;
- Sheltered areas for rearing in protected fjords in the Faroes are limited;
- The intended growth in production of up to 75,000 tonnes in a few years' time, will very much depend upon the success of farming in more exposed areas;
- Technically it will also involve bigger demands for the farming equipment;
- It is estimated that approximately 25% of the salmon produced in the Faroes is subject to an added value process prior to export. This added value is mainly obtained by exporting dinner portion cuts. Only a small proportion of the salmon are smoked in the Faroes;
- Approximately 50% of the feed required for the Faroes fish farming industry is produced by the Faroes and the rest is imported from Norway, Denmark and Iceland. Feed intended for fish farming must comply with EU regulations.

Safety certification of a fish farm

Active fish farms must be surveyed by the Maritime Authority prior to operation. Farms must comply with the rules for construction, etc. The farms must undergo a survey every second year, and/or in conjunction with major repairs or reconstruction.

The Public Food and Environmental Agency

Environment certification

The Public Food and Environmental Agency administers environmental issues, and estimates the environmental impact. According to the existing law, an environmental certification is required to farm and slaughter reared fish. Certification for a fish farm requires benthic surveys at least once a year. The farmer must inform the authorities of the amount of feed used, and how many fish are contained in the cages. Once a year the farmer must also take tests of the bottom under the farm cages to give an estimate of the environment.

The Chief Veterinary Officer

The chief vet, who has a staff of 3, is responsible for the following areas:

Import and export of live fish for aquaculture;
Monitoring and control of diseases in farmed fish.

In addition to the Chief Vet the Fish Disease Service and the Fish Health Service operate under contract with the Faroese Government. Both bodies report on an annual basis to the Chief Vet. The Fish Disease Service and the Fish Health Service are responsible for

veterinary consultations with, and inspections of, aquaculture establishments around the islands. The services also have contracts with the Faroese Fish Farmers Association for 12 inspection visits per year to smolt farms (fresh water) and 6 - 8 inspection visits per year to fish farms (salt water). To guard farmed fish against disease, it has been forbidden to import ova or salmon fry to the Faroes.

New Legislation

On the 1st of February 2001, when the Veterinary and Hygiene Agreement with the EU came into force, the importation of "livestock" into the Faroes was made possible.
The new legislation covers all infectious diseases including:

Zoonoses;
Hereditary afflicted diseases;
Feed-and environmental determined diseases;

More specific lists of the diseases have been developed in addition to the legislation.

Outbreak of ISA

Three outbreaks of ISA have been recorded respectively in:

Fuglafjørður in March 2000;
Oyndafjørður in January 2001;
Funningsfjørður in March 2001

Initiatives taken to fight ISA

In case of an ISA outbreak, the farming zone will be observed and controlled by the Chief Vet. No admittance to the area must be allowed to strangers by land or sea. Fish must not be moved to or from the site. No slaughtering of fish must take place. Any equipment used in the farming must not be moved out of the area. Shoes and clothes of the workers on the farm have to be disinfected after use. A timeplan must be prepared by the farmer for emergency slaughtering of the fish. All fish with clinical signs of the disease must be destroyed according to the existing rules.

Reimbursement

In a situation where fish are destroyed following orders from the Chief Vet, a reimbursement fund was established in 1996 for the fish farming industry. The government and the industry each donated half of the funds equity capital. With the new legislation the fund has been abolished. The public does not give any compensation for emergency slaughtering. The farmers, on the other hand, have to insure their stock.

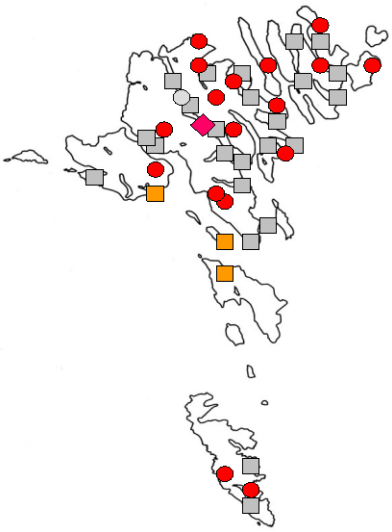
Health programme

A systematic health programme for control of fish diseases is expected to be completed in June 2001. The programme aims to fulfill EU requirements for regular inspection, sampling and reporting at all stages of production ("from fish to dish").

Hatcheries

- There are 20 companies producing smolts
- They produce from 100,000 to 1.5 million fish
- Over 50% of the salmon are put to sea as S0's
- More and more hatcheries are installing water-treatment equipment for recycling of the water
- Typical stocking sizes:
  - S0's: 35-55 grams
  - S1's: 40-80 grams

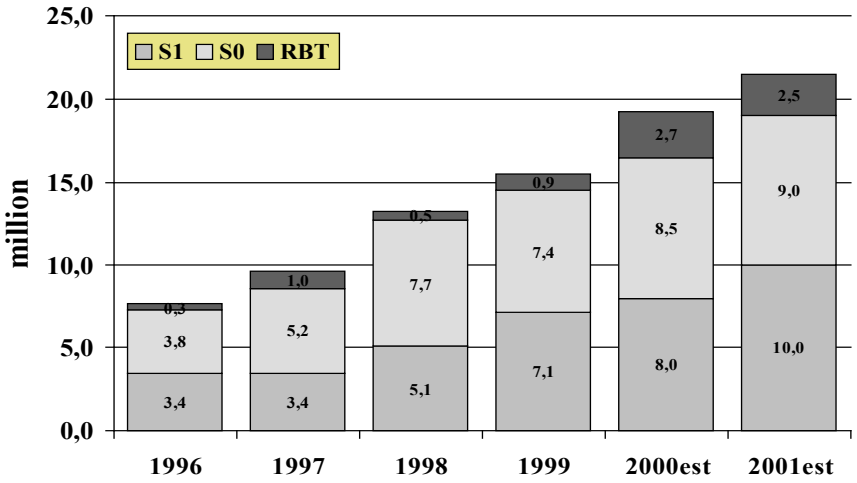
Farming sites



- Ongrowing
- Smolt
- Brood Stock
- Genetic Progr. Hatchery
- Marine Species

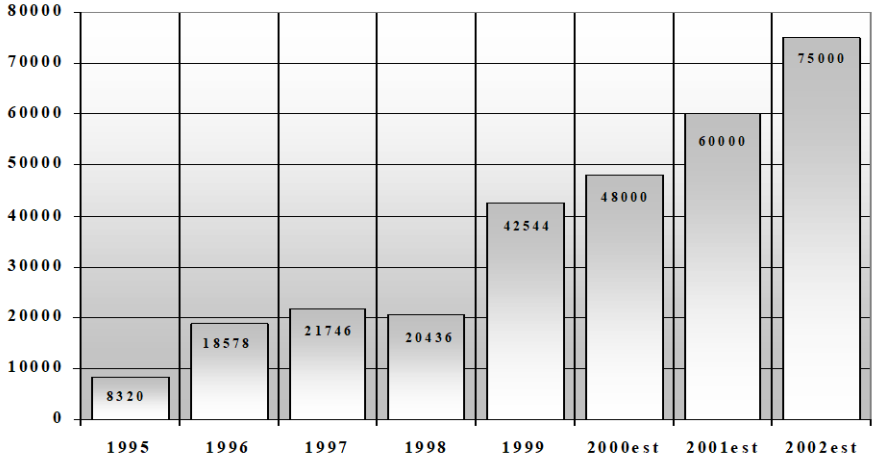
Stocking of small fish

Atlantic Salmon (S0's and S1's) and Rainbow Trout (RBT)



Total harvest per. year

MT round weight. Salmon and Rainbow Trout



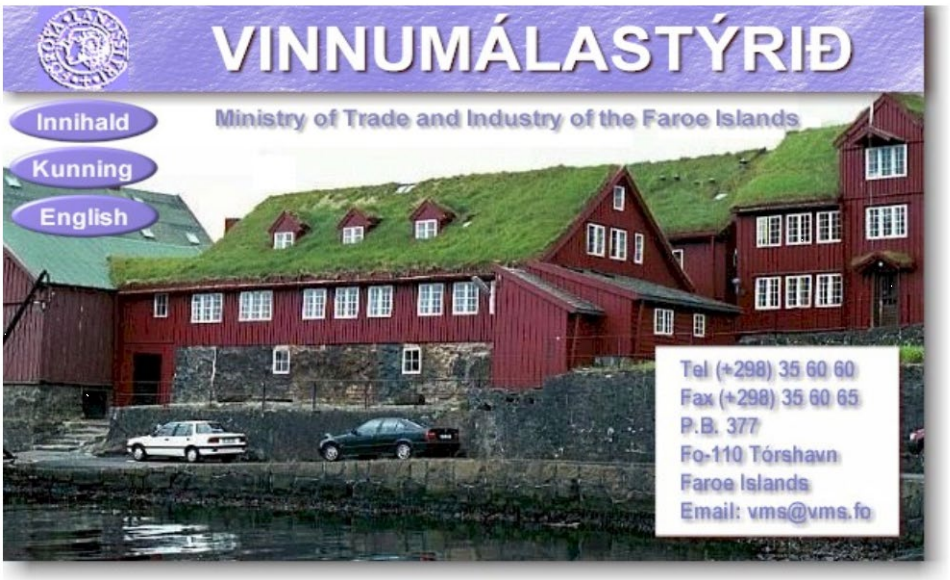
Genetic Program

A public owned company, Fiskaaling Ltd, has been given the task of providing the industry with sufficient ova and fry and improving existing salmonid strains.

Genetic program

Fiskaaling Ltd. (Goverment company)

- Genetic programme based on family selection started in 1990. 400 families are startfed each year
- Fish are tagged with an electronic tag and selected by:
  - Growth
  - Virus resistance
  - Bacterial resistance
  - Flesh colour
  - Fat distribution
  - Early maturing



DISCUSSION

David Meerburg (Canada): asked what proportion of farmed fish in the industry in Maine are European or hybrid strains, whether sperm is still being imported from Iceland and what type of marking of farmed salmon is being considered.

Ed Baum (USA): stated that he believed that in 1999 about 30-50% of the farmed salmon in Maine were European or hybrid strains but it is hard to know the exact proportion now.

Mary Colligan (USA): responded that one company in Maine had voluntarily decided to discontinue using European strains and the authorities had recommended to the Army Corps of Engineers that European strains should not be permitted. Salmon sperm from European strains may still be permitted but through the consultation process following Endangered Species Act listing it had been recommended that this practice be discontinued. It had also been recommended that all aquaculture fish be marked in a manner that would allow escapes to be traced to their farm of origin. A workshop had been held in March 2001 at which a variety of marking systems had been presented, and marking trials will commence in the fall. A Steering Committee will then select the marking methods to be used.

Jeremy Read (Atlantic Salmon Trust): asked what the impact of sea lice from farmed salmon on wild salmon had been in the USA and for details of any sea lice control strategy.

Ed Baum (USA): responded that carefully designed studies had failed to reveal evidence of impacts of sea lice on wild stocks. The control strategy involves veterinarians training site workers to aggressively monitor for lice and treat as necessary.

Sebastian Belle (USA): stated that monitoring for lice is carried out on a monthly basis. The coast of Maine is divided into three zones with lice treatments being coordinated within these zones. All treatments are supervised by veterinarians.

Henning Roed (WWF, Norway): noted that escapes of salmon from farms in one country could affect salmon rivers in another country and asked if escapes from salmon farms in Faroes are reported and the results made available to the public. He also asked for clarification of which environmental authorities in the USA are involved in assessing the licence application before the Food and Drug Administration concerning genetically modified salmon. He expressed concern about the environmental impacts of transgenic salmon since there is evidence of escapes from land-based units and current techniques cannot achieve sterility in 100% of fish treated on a commercial scale.

Ari Johanneson (Denmark (in respect of the Faroe Islands and Greenland)): indicated that at present there are no statistics on escapes of farm salmon but the approach taken has been to take action to minimise escapes. However, under new legislation there will be a requirement to monitor escapes of farm salmon. There is only one small salmon river in Faroes and there is no salmon farming in that area, and it is unlikely that a licence would be issued in future to farm in that area. He added that it is legal to shoot seals in Faroes in order to prevent them damaging fish farming equipment.

Mary Colligan (USA): confirmed that in considering an application for a licence to produce transgenic salmon the Food and Drug Administration would need to comply with existing environmental policy, including the provisions of the Endangered Species Act. The Fish and Wildlife Service and National Marine Fisheries Service have indicated to the Food and Drug Administration that there would need to be a section 7 assessment of the impacts of transgenic salmon on the wild stocks.

Bill Taylor (Atlantic Salmon Federation): noted that the US Fish and Wildlife Service and National Marine Fisheries Service had recommended against the continuing use of non-native strains in the US salmon farming industry and asked if a timeframe had been set for phasing out such use. He also referred to the reference in the Oslo Resolution to the use of wild salmon protection zones and asked for clarification of the US Government's view on such zones.

Mary Colligan (USA): indicated that the ongoing consultation process would recommend a timeframe for phasing out use of non-native strains. However, since the listing, two new sites have been approved on the condition that there is no use of non-native strains at these sites. She stated that there are currently no proposals for wild salmon protection zones in the US but the listing has identified an area of particular concern. Under the Endangered Species Act there is a need to specify critical habitat so it is possible that the issue of protection zones will be considered further in the future.

Peter Cronin (Canada): asked how the speakers would define local and non-local strains of salmon.

Mary Colligan (USA): stated that, in the USA, non-local strains would be strains not native to North America.

Jan Arge Jacobsen (Denmark (in respect of the Faroe Islands and Greenland)): stated that Faroese stocks were originally imported from Iceland (Elidaar river) in the 1960s and were used in enhancement programmes in the Faroes.

Arni Isaksson (Iceland): indicated that, for wild salmon, local stocks would be defined on an individual river basis. For aquaculture, it is the stock presently reared in Iceland which is derived from Norwegian stocks.

Chris Poupard (Salmon and Trout Association): asked if the source of the outbreak of ISA in the Faroes was known.

Ari Johanneson (Denmark (in respect of the Faroe Islands and Greenland)): indicated that it was uncertain but it was possible that the virus was transported to Faroes from Shetland in the ballast water of a ship used to carry feed, or by other species of wild fish, such as herring, moving between Norway and Faroes.

Ray Owen (USA): asked if Iceland and Faroes were intending to require tagging/marking of farmed fish and whether or not other countries require this.

Arni Isaksson (Iceland): stated that in Iceland all new cage culture facilities must micro-tag 10% of their fish but the authorities would prefer that all farm salmon were tagged.

Ari Johanneson (Denmark (in respect of the Faroe Islands and Greenland)): stated that, in the Faroes, there is no requirement to tag or mark farmed salmon.

Steinar Hermansen (Norway): indicated that there is no requirement to mark farmed salmon in Norway but the issue is being considered.

David Bevan (Canada): confirmed that there is no requirement to tag farmed salmon in Canada.

David Dunkley (EU - Scotland): advised that there is no requirement to mark farmed salmon in Scotland but the situation is being monitored.

Ken Whelan (EU - Ireland): indicated that there is no requirement to mark farmed salmon in Ireland but salmon farms are showing interest in microtagging from the point of view of product traceability. He advised that technology is available that could vaccinate, finclip and tag salmon in one operation.

Chris Poupard (Salmon and Trout Association): referred to a recent legislative review in England and Wales which had recommended tagging all farmed fish.

Richard Behal (Federation of Irish Salmon and Sea-Trout Anglers): stated that all farmed smolts should be microtagged in all countries and he asked why sterile salmon are not used in order to avoid the dangers associated with inter-breeding between farmed and wild salmon. He noted with interest the fact that the Faroes farming industry is two-thirds owned by Faroese inhabitants since the situation is very different in Ireland, and this is an important factor in considering the economic benefits of the industry in relation to damage to wild stocks. He referred to the limited progress in managing the salmon farming industry in Ireland.

Arni Isaksson (Iceland): indicated that there is the possibility of requiring salmon farmers in Iceland to use sterile fish but the industry has advised that this would not be feasible for the time being. He asked for clarification from the industry on this point.

Sebastian Belle (USA): responded that much research has been carried out on triploid salmon but their performance in salt water has not been as good as that of diploid fish. He referred to some promising trials conducted in British Columbia but indicated that he believed it was premature to consider growing sterile salmon on an economic basis at present.

Ken Whelan (EU - Ireland): referred to the results of work conducted in Europe with triploid salmon which indicate that performance of triploids at sea was good but that there had been some problems early in the freshwater phase which could have economic consequences. Studies of the behaviour of escaped sterile salmon indicate that compared to diploid escapes a very small proportion return to freshwater. He stressed that there is, therefore, a need to see how the problems with diploids can be avoided since they may offer benefits in avoiding genetic interactions with the wild stocks.

Mary Colligan (USA): indicated that in the US, the National Marine Fisheries Service and the salmon farming industry are monitoring research on sterile salmon.

Ray Owen (USA): referred to the introduction of Forest Certification Schemes and asked if similar certification might be used in order to promote best management practice in salmon farming.

Mary Colligan (USA): indicated that certification had been discussed in the USA in relation to development of Codes of Containment but no decision had been taken.

Tom Grasso (WWF): stated that WWF is interested in sustainable certification. In partnership with Unilever, WWF had established the Marine Stewardship Council which had approved certification of four capture fisheries including that for Alaska salmon. He believed there were opportunities to develop certification for salmon farming and that there might be financial benefits to the industry if their product could be shown to be safe to the wild stocks. He indicated his willingness to work with industry and government representatives on this issue.

Jack Taylor (Canada): referred to the agreement between the Maine Aquaculture Association and environmental groups and asked what the impact of this would be on the listing.

Mary Colligan (USA): indicated that there had been positive discussions with those involved in developing the agreement. A number of questions had been raised and the proposal had been made to establish a Steering Committee to consider the next steps. Those involved with the agreement had been advised of the timescale for Section 7 Consultations under the Endangered Species Act and the details of the agreement will need to be reviewed in the next few months.

David Dunkley (EU - Scotland): referred to standards laid down by Scottish Quality Salmon which apply to its member salmon farming companies. In Scotland, at least, the industry is taking quality schemes seriously.

Henning Roed (WWF - Norway): asked for the views of the industry on the scale of escapes from salmon farms and on genetically modified salmon.

Arni Isaksson (Iceland): stated that in Iceland there is no salmon farming to speak of so catches in the rivers do not include escapes.

Jan Arge Jacobsen (Denmark (in respect of the Faroe Islands and Greenland)): stated that catches of wild salmon in Faroes are small but farmed salmon do occur in rivers and also in catches at sea.

Ed Baum (USA): stated that rivers in Maine are monitored for escaped farmed salmon and the results are reported to ICES. Small numbers of escaped farmed salmon have been recorded in some rivers but these fish may be more numerous than the remaining wild stocks. Immature farmed salmon appear to feed in the lower reaches of rivers.

Steinar Hermansen (Norway): indicated that reasonably good statistics exist on the occurrence of escaped farmed salmon in catches in Norway and that those statistics are reported to ICES.

Sebastian Belle (USA): stated that most, if not all, producer organizations around the world had issued statements on GM salmon expressing concern about the use of GM salmon in aquaculture. The ISFA, for example, had indicated that it is opposed to GM salmon. There are concerns both for producers and consumers. However, if GM salmon became available in one part of the world it may give the industry there a competitive advantage and if GM salmon are used in future it should be in a responsible manner.

Richie Flynn (Irish Salmon Growers Association): stated that environmental organizations should note that ISFA's and FEAP's position on GM salmon is that they are emphatically opposed to their use in aquaculture. The views of the consumer are very important in this regard - the industry is moving towards becoming increasingly market-led. He stressed the importance of the Liaison Group between NASCO and the salmon farming industry and NASCO's Special Liaison Meetings which have encouraged a welcome dialogue between wild and farmed salmon interests.

David Dunkley (EU - Scotland): in response to a question seeking clarification of the Scottish Executive's view on the impact of salmon farms on wild stocks, confirmed that the Executive believed that in the west and north of Scotland impacts of aquaculture may have exacerbated the situation for the wild stocks. While the decline in wild stocks may have started before the industry developed, salmon farming has added to the burden on the wild stocks.

Jacque Robichaud (President of NASCO): thanked all speakers and contributors from the floor for a stimulating session and lively debate and closed the Special Liaison Meeting.